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Antimicrobial and Antioxidant Activity of Different Fractions of *Acacia Albida*

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Abstract:
The stem bark of Acacia albidawas extracted successively with hexane, chloroform, ethyl acetate and methanol. The antimicrobial activity of all extracts was investigated against Staphylococcus aureus, Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa, Aspergillusniger and Candia albicons. The methanol extract showed significant inhibition against all test organisms. The antioxidant activity of the methanol extract was evaluated using the2,2-diphenyl-1-picrylhydrazyl(DPPH) radical scavenging assay. The extract exhibited significant radical scavenging capacity.

Keywords: *Acacia albida, extraction, antimicrobial activity, antioxidant activity*

1. Introduction

Acacia albida also known as Faidherbiaalbidais a member of the family Fabaceae, subfamily Mimosoideae, and tribe Acaciaea[1]. Acacia albidaisa leguminous woody species distributed throughout the arid and semi-arid lands of Africa [2,3]. It is found in western, eastern and southern Africa [4].It is also found in the Middle East, Arabia and in Palestine [5].Acacia albida is found in most parts of Sudan but its best development is in the western part of the country, particularly in the Jebel Marra area. The species is distinguished from Acacia spp. by a great many morphological, ontological, and cytological characteristics [6,7].

Because of its highly nutritional leaves and fruit, A. albida provides domestic animals with excellent fodder in the dry season [8]. The gum that exudes spontaneously from the trunk is sometimes collected like gum Arabic. Pods and foliage are highly regarded as livestock fodder. Humans eat the boiled seeds in times of scarcity in Rhodesia. Uses of this plant also include firewood, charcoal. Ashes of the wood are used in making soap and as a depilatory and tanning agent for hides [9].

In African system of medicine the plant is used to treat fever and diarrhea[10], also the bark infusion is used in cases of difficult delivery and for cough. Extracts of the bark, gum and roots are the main parts used to treat many ailments [11]. A. albida is used traditionally to treat gastrointestinal disorders, particularly diarrhea[12]. Bark and root preparations are also said to have anti-malarial properties [13]. Bark is used traditionally against bleeding, inflammation of the eyes and as an emetic [14]. The bark is used also to clean teeth. It contains fluorine.

2. Materials and Methods

2.1. Plant Material

The stem bark of Acacia albida was collected from Northern Sudan. The plant was authenticated by Department of Phytochemistry and Taxonomy, National Research Center, Khartoum.

2.2. Test Organisms

Different fractions from A. albidastem bark (n-hexane, chloroform, ethyl acetate and methanol) were screened for antimicrobial activity using the standard microorganisms shown in Table (1).

No	Microorganism	Type
1	Bacillus subtilis	G+ve
2	Staphylococcus aureus	G+ve
3	Pseudomonas aeroginosa	G-ve
4	Escherichia coli	G-ve
5	Aspergillusniger	fungi
6	Candida albicans	fungi

Table 1: Test Organisms

2.3. Extraction of Acacia Albida Stem Bark

The powdered air dried stem bark of Acacia albida (300g) was extracted successively with hexane, chloroform, ethyl acetate and methanol. Evaporation of the solvent gave dark residues (0.497.g, 0.170g, 0.672g, and 16.1g. respectively). All the extracts were tested for their antimicrobial and antioxidant activities.

2.4. Phytochemical Screening

The presence of bioactive constituents particularly Tritepenes, Steroids, Alkaloids, Flavonoids, Tannins, Saponins, Coumarines and Anthraquinonesin the stem bark of A.albidawas investigated by using standard procedures described by Edeoga [15].

2.5. Antimicrobial Activity

To evaluate the antimicrobial potential of the different extracts, the cup plate agar diffusion method was adopted with some minor modifications [16]. The standard bacteria stock suspensions (2ml) were mixed with 200 ml of sterile molten nutrient agar which was maintained at 45oC. Aliquots (20ml) of incubated agar were distributed onto sterile petri dishes. The agar was left to settle and each plate was cut using sterile cork borer (No. 4) and agar discs were removed. Alternated cups were filled with (0.1 ml) of test samples using adjustable pipette, and allowed to diffuse at room temperature. The plates were then incubated in the upright position at 37oC for 18 hours. After incubation, the diameters of the resultant growth inhibition zones were measured. The same method as for bacteria was adapted for testing antifungal activity. Instead of nutrient agar, Sabouraud dextrose agar was used. The inoculated medium was incubated at 25oC for three days.

2.6. DPPH Radical Scavenging Assay

The method of Chew has been used to evaluate the antioxidant activity of the methanol extract[17]. (1ml) of plant extract was added to (1ml) of DDP Hand at the same time, a control consisting on DPPH(1ml in 1ml ethanol) was prepared. The reaction mixtures were mixed very well and then incubated in the dark at the room temperature for 30 min and the absorbance was measured at 517 nm spectrophotometrically. Ascorbic acid was used as positive control and ethanol was used as negative control .The DPPH scavenging ability of methanolic crude extract was calculated using the following equation:

% scavenging activity = [(Abs control – Abs sample)]/ (Abs control)] ×100

3. Results and Discussion

3.1. Phytochemical Screening

The methanol extract of Acacia albida stem bark was screened for major secondary metabolites. The results are depicted in Table 2.

Test	Result
Tritepenes	+ve
Steroids	-ve
Alkaloids	-ve
Flavonoids	+ve
Tannins	+ve
Saponins	+ve
Coumarines	+ve
Anthraquinones	+ve

Table 2: Phytochemical Screening of the Methanol Extract

3.2. Antimicrobial Activity

Different fractions (n-hexane, chloroform, ethyl acetate and methanol) were investigated for their antimicrobial activity against six standard human pathogens: Staphylococcus aureus (ATCC25923- G +ve), Escherichia coli (ATCC25922- G –ve), Pseudomonas aeruginosa (ATCC27853- G-ve) and Proteus vulgaris (NCTC8196), Aspergillusniger (ATCC9763) and Candia albicons (ATCC7596). The results are depicted in Table (3). Table (4) represents the antimicrobial activity of standard antibacterial and antifungal chemotherapeutic agents.

Extract(100mg/ml)	Ps	Bs	Sa	Ec	As	Ca
n-Hexane	16	-	-	12	-	-
Chloroform	13	11	12	11	11	11
Ethyl acetate	20	21	18	20	23	15
Methanol	26	25	28	31	25	15

Table 3: Antimicrobial Activity of Different Fractions

< 9mm = inactive; 9-14mm = weak inhibition, 14-18 mm = moderate inhibition
>18 mm = significant inhibition.

Drug	Conc. mg/ml	Bs	Sa	Ec	Ps	An.	Ca
Ampicilin	40	15	30	-	-	-	-
	20	14	25	-	-	-	-
	10	11	15	-	-	-	-
Gentamycin	40	25	19	22	21	-	-
	20	22	18	18	15	-	-
	10	17	14	15	12	-	-
Clotrimazole	30	-	-	-	-	22	22
	15	-	-	-	-	17	17
	7.5	-	-	-	-	16	16

Table 4: Antimicrobial Activity of Standard Chemotherapeutic Agents

The hexane extract of *Acacia albida*gave moderate inhibition against *Pseudomonas aeruginosa* and weak inhibition against *Escherichia coli*. The chloroform extract showed weak inhibition against all tested organisms. The ethyl acetate extract showed moderate activity against *S. aureus* and significant activity against other test organisms.The methanol extract exhibited moderate anticandidal activity. However it showed significant inhibition against other test organisms.

3.3. Antioxidant Activity

The antioxidant activity of the methanol extract was evaluated using DPPH bioassay. The results are depicted in Table (5).In DPPH method the antioxidant capability of the methanol extract is determined by the decrease in absorbance at 517 nm. The methanol extract exhibited significant antioxidant activity

Sample	RSA± SD% (DDPH)
Methanol extract	89.6±0.03
Standard(propyl gallate)	92.2 ±0.01

Table 5: Radical Scavenging Activity of MethanolExtract

4. Conclusions

Acacia albida has a variety of uses in folk medicine. This study focuses on the antimicrobial and antioxidant activities of different fractions of *Acacia albida*.The methanol extract was found to possess significant antimicrobial activity against six standard human pathogens. Also it exhibited significant radical scavenging capacity in theDPPH bioassay. Isolation and characterization of the active constituents of this extract is highly recommended.

5. References

i. P. J. Wood"The botany and distribution of Faidherbiaalbida, in West African semi-arid tropics," in Proceedings of the Workshop, R. J. Vandenbeldt, (Ed.), International Crops Research Institute for the Semi-Arid Tropics, International Centre for Research in Agroforestry, Niamey, Niger.1992.View at: Google Scholar
ii. P. Danthu, B. Hane, P. Sagna, and Y. K. Gassama"Restoration of rooting competence in mature Faidherbiaalbida, a Sahelian leguminous tree, through serial root sucker micrografting," New Forests. vol. 24, no. 3, pp. 239–244.2002. View at: Publisher Site | Google Scholar
iii. N. C. Mokgolodi, M. P. Setshogo, L.-l. Shi, Y.-j. Liu, and C. Ma"Achieving food and nutritional security through agroforestry: a case of Faidherbiaalbida in sub-Saharan Africa," Forestry Studies in China., vol. 13, no. 2, pp. 123–131.2011. View at: Publisher Site | Google Scholar
iv. Vandenbelt, R.J.Agroforesry Systems. Springer Netherlands.14(3), 233.1991
v. Wickens, G.E. A study of Acacia Albida as feed resource for livestock. Kew Bulletin.,23 (2) ,181.1969.
vi. EI Amin, H.M.Taxonomical classification of the Sudanese AcaciasM.Sc. Thesis University of Edinburgh, UK.1972.
vii. Yagi, Yagi, S.M.Chemotaxonomical and phonological studies on someSudan Acacias. M.Sc. Thesis University of Khartoum.1988.
viii. G. W. Sileshi. "The magnitude and spatial extent of influence of Faidherbiaalbida trees on soil properties and primary productivity in drylands," Journal of Arid Environments. vol. 132, pp. 1–14.2016.View at: Publisher Site | Google Scholar

ix. Mulofwa, J., S. Simute and A.Tengn.Agro-forestry: manual for extension workers in southern province, Zambia. Swedish International Development Authority (SIDA), RegionalSoil Conservation Unit (RCSU), Nairobi, Kenya. Technology hand book.No. 4, 199p. 1994.
x. Tijani AY, Uguru MO, Salawu OA. Anti-pyretic, anti-inflammatory and anti-diarrhoeal properties of Faidherbiaalbidain Rats. African Journal of Biotechnology. 7:696-700.2008.
xi. Barnes, R. D. and Fagg, C.W.Faidherbiaalbida Monograph and Annotated Bibliography. Tropical Forestry Papers No. 41. Oxford ForestlyIstitute, UK,2003,267pp.
xii. Muhammad, S.,Mushtaq, A., Ashfaq, A. Chemistry of the medicinal plants of genus Acacia. J.Medicines Act., 41:63-67.1998
xiii. Salawuo, O. N. and Tijani, A. Y. Archives of applied Science Research. 2010. 2(5),261.
xiv. Gill LS. Medicinal uses of trees and plants in Africa. University of Benin Press, Benin, Nigeria. pp. 27.1999.
xv. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. Afr. J. Biotechnol. 4(7): 685-688.2005.
xvi. Kavanagh, F.Analytical Microbiology||, Vol. II, Academic Press (Pub) New York and London, P 11.1972.
xvii. Chew YL, Goh JK, Lim YY. Assessment of in vitro antioxidant capacity and polyphenolic composition of selected medicinal herbs from Leguminosae family in Peninsular Malaysia. Food Chem.,119, 373-378.2009.